

FACTS



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RATS AND THEIR CONTROL



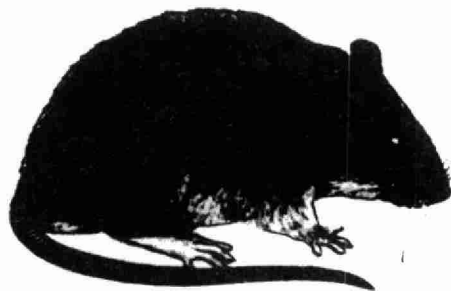
Introduction

The order Rodentia, or gnawing mammals, includes creatures such as rats, mice and beavers which are characterized by two pairs of incisor teeth. These are separated from the molars by a gap, since the canine teeth are absent. Rats and mice are often called commensal rodents because they benefit from their proximity to another species - Man. The Norway Rat *Rattus norvegicus*, which is the only rat of economic importance in Ontario, probably originated in Central Asia and moved with man along the trade routes. It is believed that the first rat arrived in North America around 1775.

Rats are pests because of the damage they do to food and property, and because of the many serious diseases associated with them.

Identification

- | | |
|----------------|---|
| Weight | - 200 - 480 gm (7-17 oz) |
| Overall length | - 30 - 45 cm (12" - 18") |
| Colour | - Various, brownish-grey back/greyish-white belly |
| Toes | - Fore paws four and hind paws five |
| Snout | - Blunt |
| Ears | - Thick and short with fine hairs |
| Droppings | - Capsule shaped, 25-30 mm (3/4") long and often containing hairs. 40 to 125 are dropped each day. |
| Tail | - Stout, shorter than body; dark above and pale beneath. 12.5 - 20.5 cm (5" - 8") in length |
| Teeth | - Grow up to 12.5 cm per year, but wear through gnawing keeps their length almost constant. Only the front surface of the incisors is covered with enamel, thus keeping them sharp and chisel-like. |
| Eyes/Sight | - Small, poor eyesight and colour blind. |



Norway Rat



Norway Rat
Walking

NORWAY RAT
AV LENGTH
20 mm.
Fecal pellets of rats



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Life History

The young are born blind following a gestation period of between 20 to 25 days; litters consist of from two to twenty-two young, between five and twelve being usual. The eyes open on about the 14th day and the rat travels freely after one month. It reaches sexual maturity at three months and females produce usually four to seven litters per year. Length of life in wild conditions is about one year.

Habits

Normally, a rat lives at or near ground level. It nests and burrows in the ground, under buildings, in rubbish and rubble, under lumber and litter of various types. It is an excellent climber, swimmer and jumper, and is found everywhere, including cities and farms. Dumps and sewers are major habitats. It will live both inside and outside buildings but has a large home range of 15-30 metres. It is essentially a nocturnal animal, although sometimes active during the day, and prefers narrow, concealed, out-of-the-way routes when moving about. Since it is a creature of habit, it tends to follow the same pathways; however, it is highly adaptable.

Why Control Rats?

1. Because of their mode of life in close proximity to man, rats, and their parasites, can easily carry serious diseases which are transmissible to humans.
2. Rats are prolific breeders.
3. A rat eats approximately 30 to 90 grams of food per day and damages much more with urine and faeces.

Suggested Procedure for a Rodent Control Programme

- A. The first step in any rodent control programme is to survey the area to determine:
 1. The centre and the extent of their population
 2. The location of their resting places
 3. Their source of food

Useful Pointers:

- a) each live rat seen could indicate the presence of 10 to 20 or more unseen.
- b) partly eaten freshly dead rats, particularly when the greater part of the viscera has been consumed through a single hole in the body wall, indicates the presence of many live rats.
- c) droppings are the most frequent and dependable indication of rodents.
- d) smears and marks left on walls and floors indicate runways and harborages.

- e) tracks may be left in soft or powdery materials.
 - f) food gnawed by rats loses its freshly gnawed appearance in 24 hours, whereas wood loses it after about one week.
 - g) nest(s) may be found, (the condition of adjacent droppings may indicate whether they have recently been occupied).
 - h) musty odour which is invariably present with rats may linger after they have gone.
 - i) undue excitement of domestic animals will often indicate rodents.
- B. Plan the best method of removing the pests, and begin by eliminating rat harborages. Three general types:
- 1. Structural: double walls, spaces between floors and ceilings, beneath basement floors and floors resting directly on ground.
 - 2. Incidental: furniture, fixtures, equipment, etc.
 - 3. Temporary: stored materials, if left undisturbed for several weeks.
- C. Install rat proofing and keep it well-maintained.
- D. Deny rats a source of food. Food storage rooms and warehouses should be rat-proofed. Seek cooperation from everyone in the premise in keeping doors closed, and the premise clear of lunch scraps and other possible sources of nourishment.
- E. Keep piles of lumber and miscellaneous heaps of equipment, which harbour rats, stacked neatly on platforms 30 to 45 cm above ground. Rats do not feel safe in such open places and avoid them. See Figure 2.
- F. All harborages and food supplies adjacent to premises should be removed.
- G. Pre-baiting should be used before trapping and poisoning to:
- 1. determine the most acceptable baits. Rats may refuse some baits. Meats, grains, pastry, break, edible oils and fruit have all been used successfully.
 - 2. determine the best locations of baits and traps.
 - 3. allay natural suspicion they may have toward a trap by pre-baiting, i.e., baiting but not setting the trap until they are accustomed to it.
- Bear in mind that no bait may be taken for a week. The bait should be scattered in small pieces so that the animal is prevented from removing enough for a cache, and it should not be left out during the daytime. A rat usually eats at dusk and dawn. The dominant male or alpha rat is usually the first to feed.

H. Baiting Techniques and Eating Habits:

1. When setting out baits or traps, try to think like a rat, keeping to protected and sheltered areas.
2. Place a piece of cardboard on the floor of a metal bait cafeteria. Rats have no fur on their feet and will not readily take bait if their feet are too hot or too cold.
3. A rat needs to drink water which is usually scooped up with the paws. (It can lick water if it is not deep enough to scoop). Its consumption varies from 400 ml to 850 ml a day, so water can be a useful medium for liquid baits.
4. A rat tends to drag food away to eat it, rather than to consume it at the bait station. Solid baits are therefore most effective.
5. It is often useful to find out what the rat is eating or drinking and to choose a suitable bait.
6. Insufficient bait is often a reason for lack of control. Rats eat approximately 30 - 90 grams daily.
7. Its main diet is meat, grain and eggs.
8. Place snap traps at right angles to walls.
9. Use both dry and liquid type baits when using anticoagulants.

I. Garbage Handling:

Attention to garbage and disposal is vitally important: in residential areas, garbage provides rats with both food and water. It is equally important in commercial food handling establishments and rural areas. In residential situations, garbage should be wrapped in plastic bags until final disposal in tight containers. Metal garbage cans should be:

1. rust-resistant and water tight.
2. adequate to store the garbage between collections.
3. fitted with secure lids attached by a chain to an immovable object.
4. made with recessed bottoms.
5. kept on a concrete base or raised 45 cm (18") off the ground. See Figure 1.

J. Continuing inspection of control measures:

Rats will make great efforts to break through new rodent-proofing during the two weeks following its installation. See Figure 3-9. It is therefore necessary to keep close watch during this period. Do not forget that rats may be trapped inside the building by the proofing, and these must be exterminated. Any breakdown of the proofing must be repaired immediately otherwise the rats will re-invade the building. Pay particular attention to the following on the outside of the building:

1. Doors.
2. Cracks and holes in structure.
3. Windows and vents.
4. Loading docks.
5. Weeds and other vegetation.
6. Utility openings and ducts.
7. Old equipment, pallets, boxes, etc. stored against the building.

The interior should be checked for:

1. Floor drain caps tightly sealed.
2. Pipe and other utility line openings in interior walls and floors.
3. Holes and cracks in expansion joints.
4. Sources of food, water and shelter.

The following minimum kit should be carried by technicians for patching holes:

1. Hammer.
2. Pliers.
3. Tin snips.
4. 25 and 40 mm masonry nails.
5. Assorted wood nails and staples.
6. Odd cuts of galvanized tin.
7. Odd cuts of 6 mm hardware cloth.

A more complete rodent patch kit would also include:

1. Screwdriver.
2. Assorted screws.
3. Keyhole or coping saw.
4. Ice pick or awl.
5. Staple gun..
6. Caulking compound.
7. Plastic wood.
8. Tape measure.
9. Concrete mix, bucket, trowel.
10. Plaster patching compound.
11. Sheet metal.
12. Contact, white and epoxy glues.
13. Stainless steel wool.
14. Short lengths of wire.
15. Wood blocks and dowels.

A final reminder — a building will remain rodent-proof only as long as the protective measures are maintained. Breaks in proofing, unthinking actions in propping doors or windows open, and later construction which damages rodent-proofing, may undo all the previous work. Constant inspection of proofing to deny the rats access is as necessary as plugging up all the holes in a sinking boat.

Ultrasonic Sound Devices: High frequency sound waves to repel rodents have been in use for several years. The human ear detects sound in a range of 20-20,000 pressure variations per second. This is called the frequency and is measured in cycles per second or Hertz. Rats can detect ultrasonic sounds at levels of up to 100,000 Hertz. The intensity of the sound (measured in decibels) can also create a deterrent effect on rats at levels over 85 decibels. Ultrasonic units influence the rodents by moving them out of the sound area to shadow areas. The use of mechanical or chemical control practices in these shadow areas assist the rodent reduction program.

The following ultrasonic devices are currently registered by Agriculture Canada on the condition they are efficacious when used in conjunction with other proven rodent control measures:

AV - Alarm Verminex	PCP #20304
Pestchaser	PCP #19674
Rodent Guard	PCP #17818
Rodent Sentry Model RS12-2	PCP #16418
Transonic V	PCP #18496

Mechanical Control: consider the use of glue boards or snap traps. Both should be secured to prevent movement by the rat.

Rodenticides: There are three types of rodenticides:

- a) Anticoagulant rodenticides - multiple dose
- b) Anticoagulant rodenticides - single dose
- c) Acute rodenticides

Anticoagulant rodenticides (multiple dose) require continued feeding of the rodent over several days to provide a lethal dose. Anticoagulant rodenticides (single dose) act quicker to reduce rodent populations. Death occurs several days after a single feeding with most single dose anticoagulants.

Anticoagulants decrease the clotting ability of the blood and cause death by internal hemorrhaging. The antidote for poisoning by these rodenticides includes a whole blood transfusion and the administration of Vitamin K₁ by a physician.

Acute rodenticide formulations are more toxic and are used to rapidly reduce rodent populations. All acute rodenticides can be used only by licenced pest control applicators.

General Precautions:

Rodenticides should never be used indiscriminately. Bait stations should be used with all rodenticides to prevent children or pets from tampering with the bait or accidentally eating it.

In the household, rodenticides labelled **Domestic** and all unused baits should be kept in a safe place, locked and labelled "POISON". A record should be kept of all rodent baits used and where they are placed. All unused baits should be safely discarded with household refuse.

The **Registered** label is the final authority for use of the rodenticide product. **READ THE LABEL** before using the rodenticide in order to determine whether the pest you intend to control is listed on the label. **READ AND FOLLOW** the directions and precautionary statements on the label. All rodenticides are potentially hazardous and should be used by a responsible individual in a safe and proper manner. Store all rodenticides in original containers inaccessible to children, pets, livestock and wildlife.

The following active ingredients are registered for the control of the Norway rat. Consult the LABEL for proper use directions.

Rodenticide Type	Active Ingredient	Trade Names	Mode of Action	Secondary Poisoning Potential
Multiple-dose Anticoagulants	Warfarin	Warfarin	reduce clotting ability of blood	moderate
	Coumafuryl	Fumarin	"	moderate
	Pindone	Pival, Pivolyn	"	moderate
	Chlorophacinone	Rozol	"	high
	Diphacinone	Ramik, Diphacia	"	high
	Warfarin + Sulfaquinoxaline	Prolin	"	moderate
	Warfarin + Ergocalciferol	Sorex	" plus hypercalcemia	low
Single-dose Anticoagulants	Bromadiolone	Bromone, Maki	reduce clotting ability of blood	high
	Brodifacoum	Talon, Ratak		high
Acute	Alphachlorohydrin (3-chloro-1, 2, propanediol)	Epibloc	liver/kidney sterilant (male)	low
	Scillisoside	Red Squill	paralysis of heart	low
	Cholecalciferol	Vit D ₃	hypercalcemia	low
	Zinc Phosphide	Quintox ZP, Phosbait	stomach acids release phosphine gas - paralysis of heart	low

This publication has been reviewed by the Ontario Pesticides Advisory Committee.



**PESTICIDES ARE POISONS –
TREAT THEM AS SUCH**

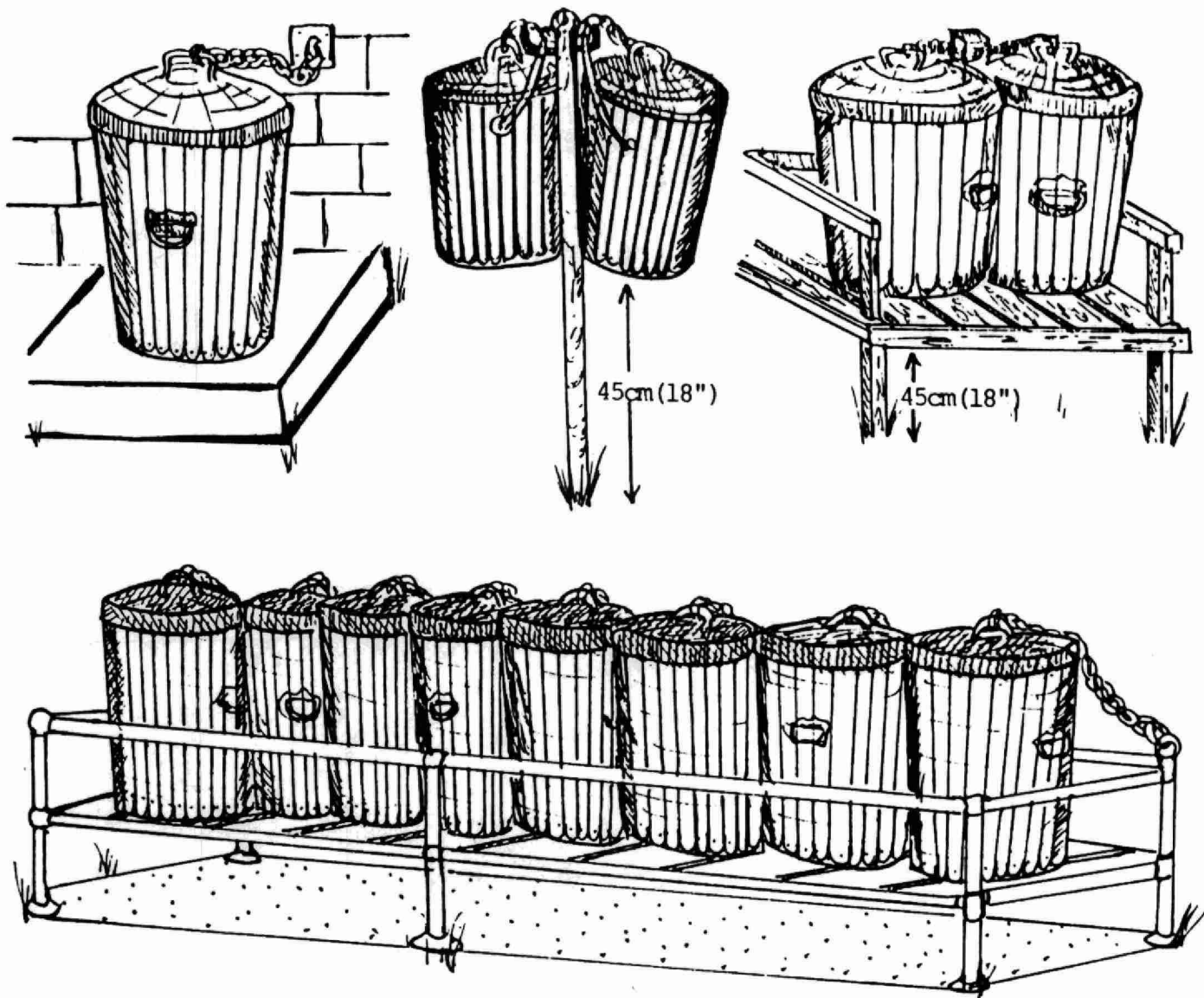


FIGURE 1 PROPER GARBAGE STORAGE

On commercial premises, garbage and refuse should be kept in bulk storage containers or rodent-tight rooms. Bulk containers with drain holes should have these capped with hardware cloth to prevent rodent access.

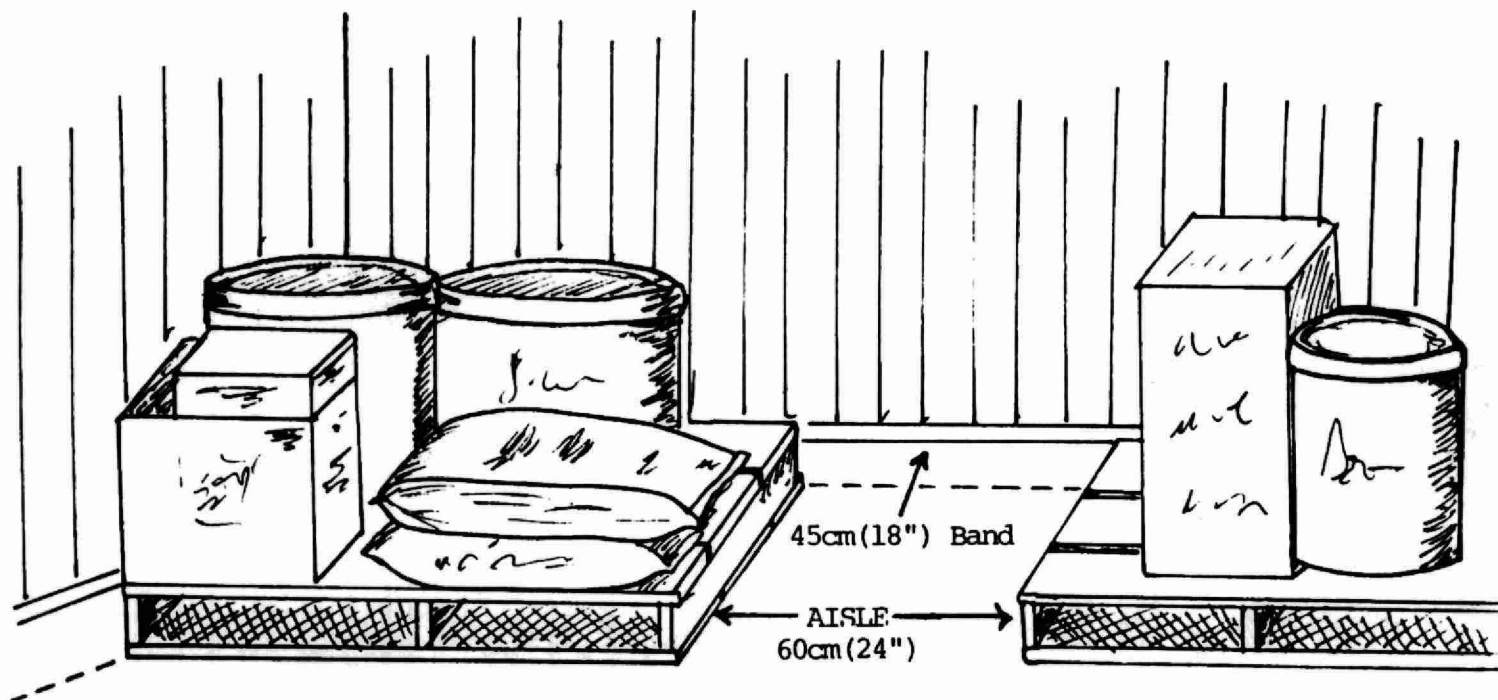


FIGURE 2 PROPER STORAGE OF SUPPLIES

Food and feed on commercial premises must be stored properly. Where possible, these materials should be kept in rodent-proof containers or rooms. Sacked foods should be kept in orderly piles preferably on pallets so that they can be readily moved. A 45 cm (18") strip of light-coloured paint should be painted around the base of the walls in the warehouse. Warehousemen should be ordered not to pile supplies against the walls on top of these strips. This permits easier inspection and treatment in rodent control work. Stored produce should be intersected by frequent aisles, and daily sweeping or vacuuming of spilled foods should be made routine.

Nonfood supplies such as boxes, machinery, sacked goods, lumber, building supplies, etc. should be stacked away from the walls and kept off the ground to aid access to the area. These need be inspected for rodent infestation as frequently as the food stores.

Reduction of outdoor harborage around the plant (or residence) will assist in relieving the constant pressure from an outside rodent population to get in. Racks should be built to hold stacked lumber, building supplies, rubbish, etc. 45 cm (18") off the ground. Other outdoor harborage such as weeds, brush, and junk piles should be trimmed and removed.

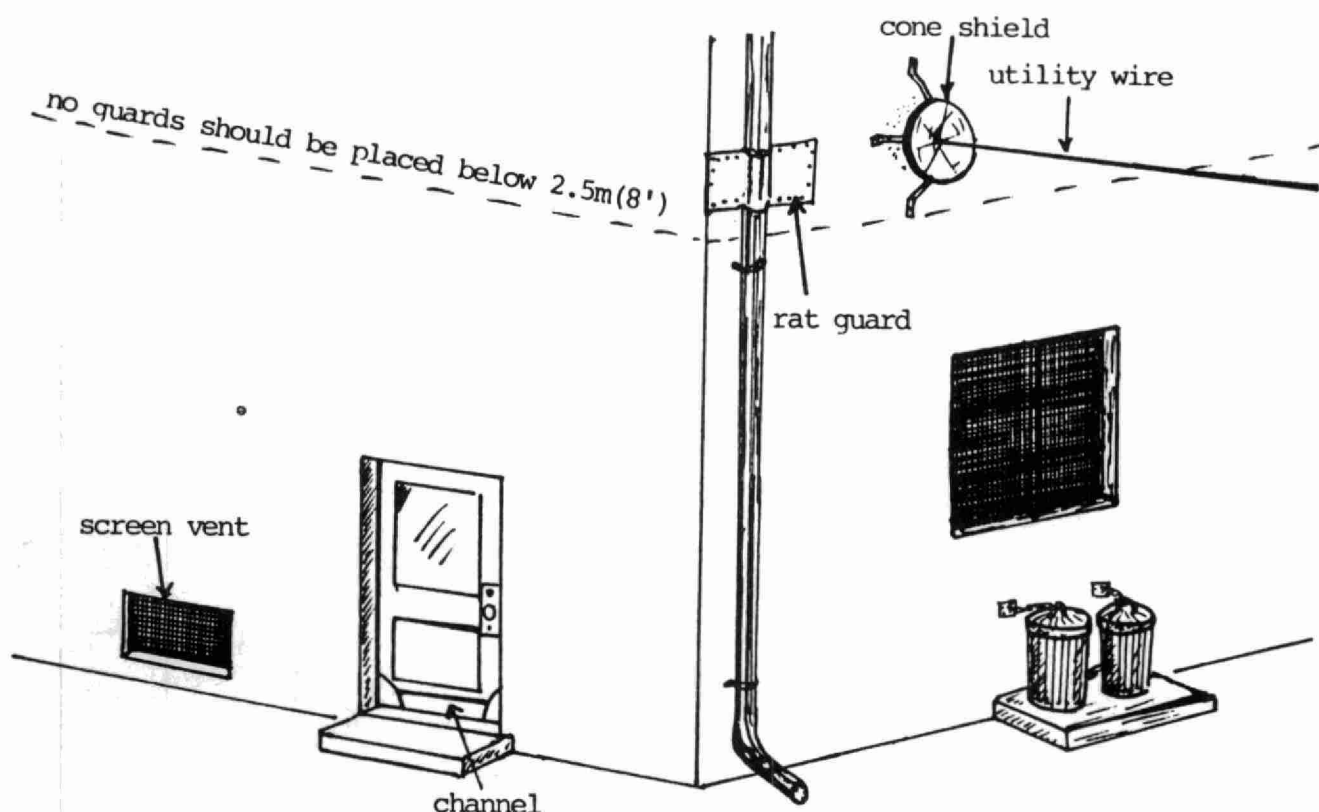
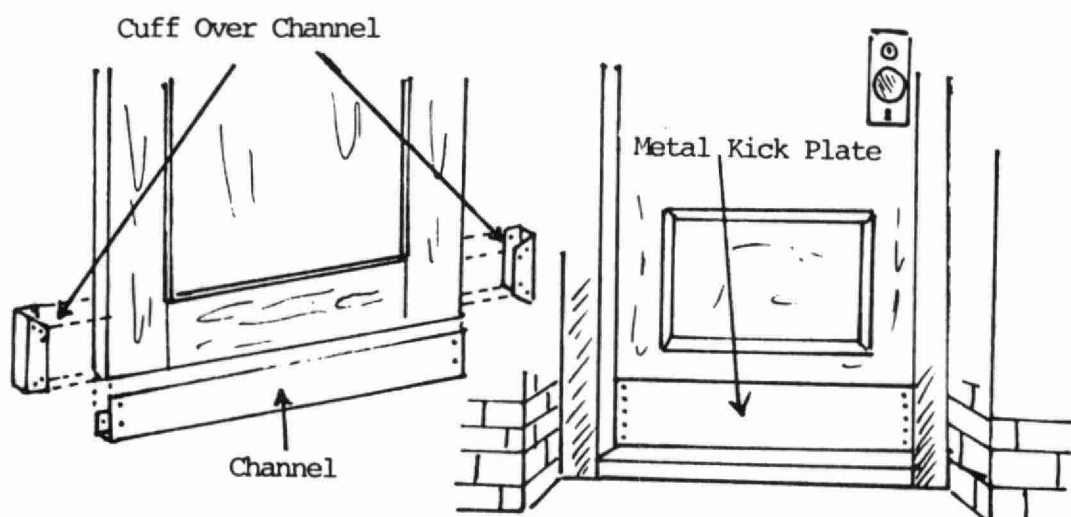


FIGURE 3 PROPER RAT-PROOFING TREATMENT OF DOORS, WINDOWS, UTILITY LINES, ETC.

Like humans, rats find the easiest entrances are doors. Tight-fitting doors with a sill clearance of less than 1 cm (3/8") are not easy for rats to get into if they are kept closed. In this respect the addition of self-closing devices may be useful in preventing human carelessness. Doors with clearances big enough to be entered by rats should have metal channels or butt plates as shown in Figure 3. Where sills have rotted or been chewed out, these should also be covered with metal.



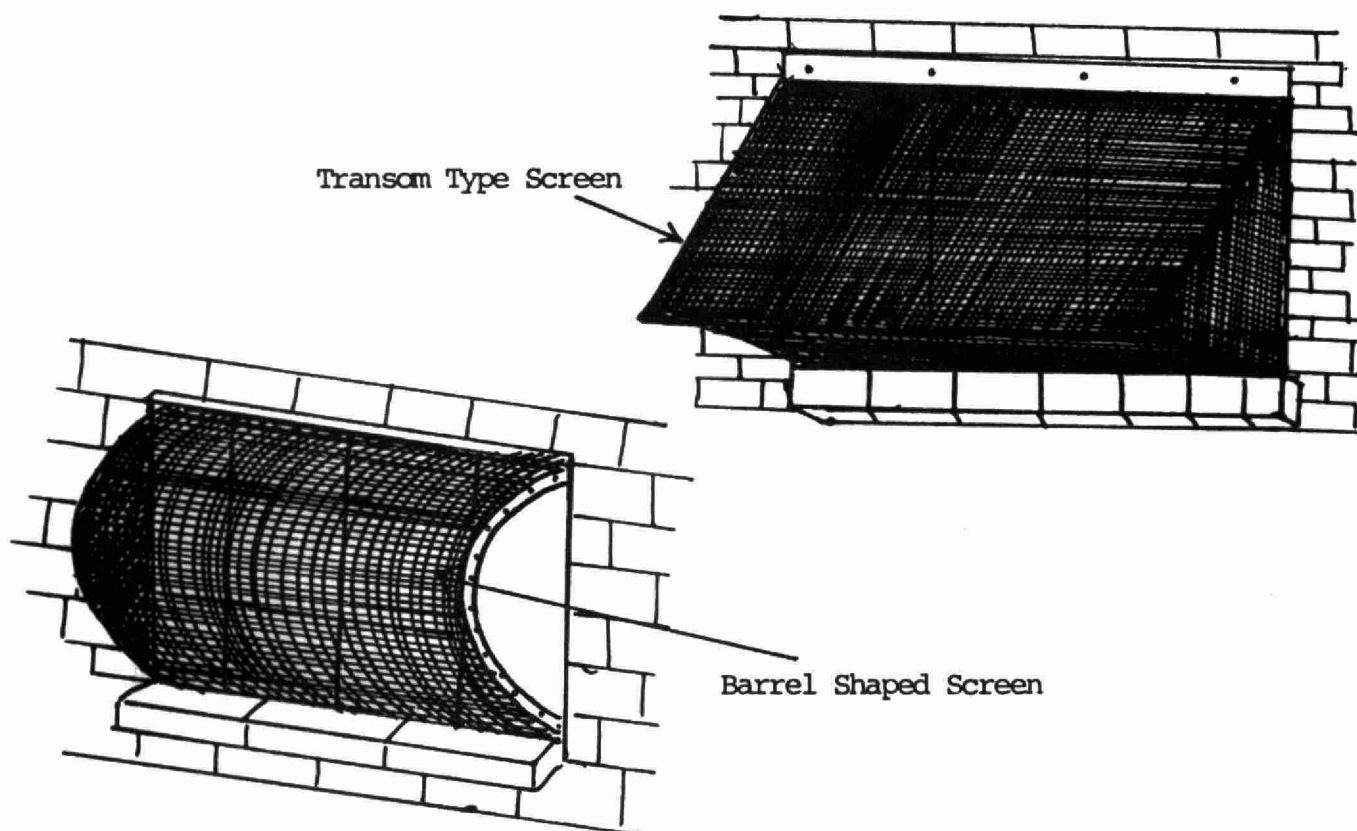
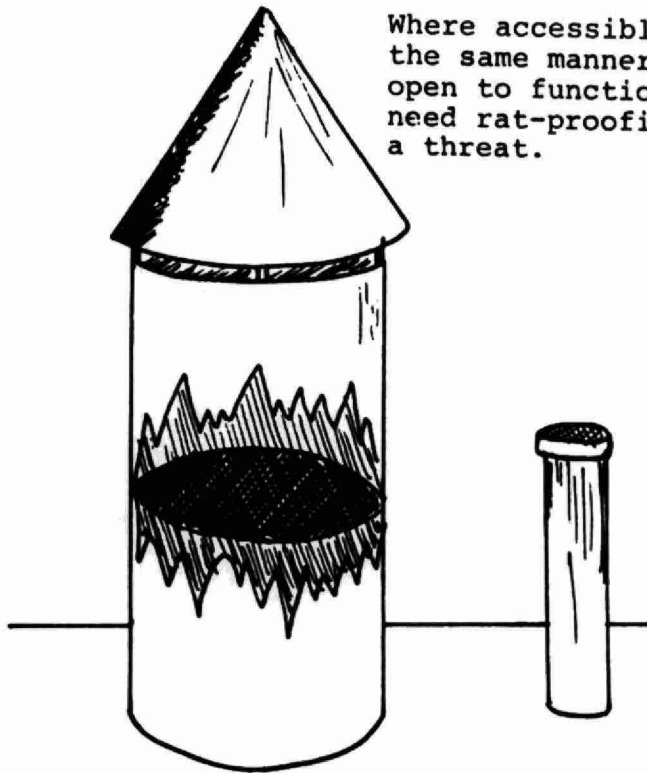


FIGURE 4 RAT-PROOFING STRUCTURES FOR WINDOWS

Windows left open at night are particularly vulnerable. If they have mosquito screens this will probably be satisfactory, but if screening has to be built for the windows, it should be heavier -- 6 mm ($\frac{1}{4}$ ") hardware cloth. When attached to wooden framing, the metal wire should be wrapped around the edge of the frame. Windows that swing out horizontally need be protected with a basket device. Windows that do not need to be opened should be nailed shut and any broken glass repaired.

FIGURE 5 SCREENED ROOF VENTS



Where accessible to rats they should be screened in the same manner as windows since they must be kept open to function properly. Roof vents do not normally need rat-proofing except where roof rat invasions are a threat.

FIGURE 6B SEWER RAT GUARD

Drain pipes in particular should be screened and kept in good repair. Where there is a recurrent problem or where individuals fear rats climbing up sewer pipes and swimming through the water seal in toilet bowls, a rat guard can be installed. This is a piece of pipe, 20 cm (8") in diameter and approximately 76 cm (30") long, cut into a vertical sewer pipe to prevent this from happening.

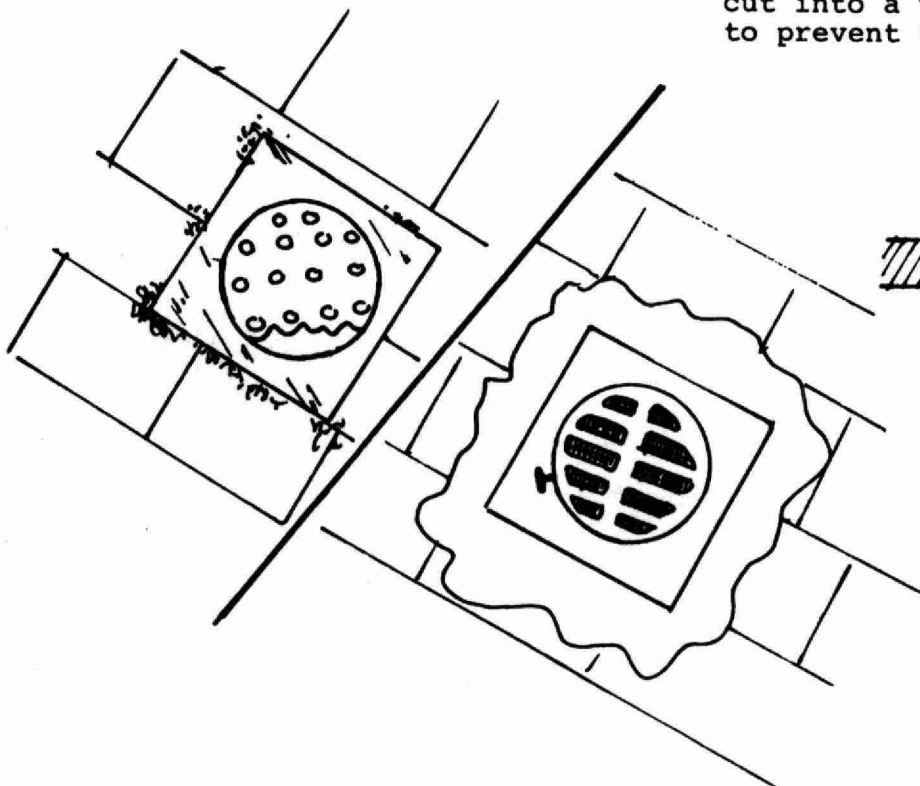


FIGURE 6 REPAIR AND SCREEN FLOOR DRAINS

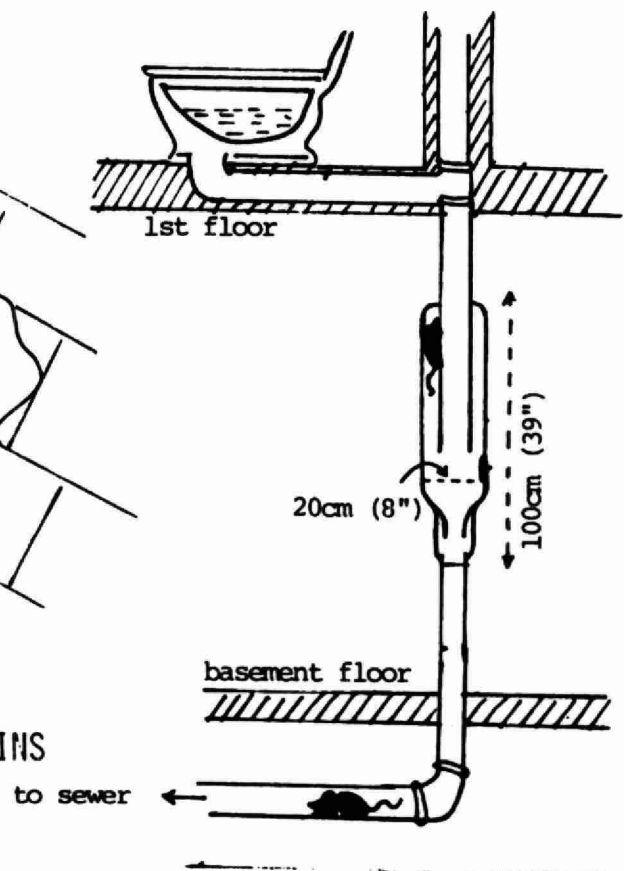
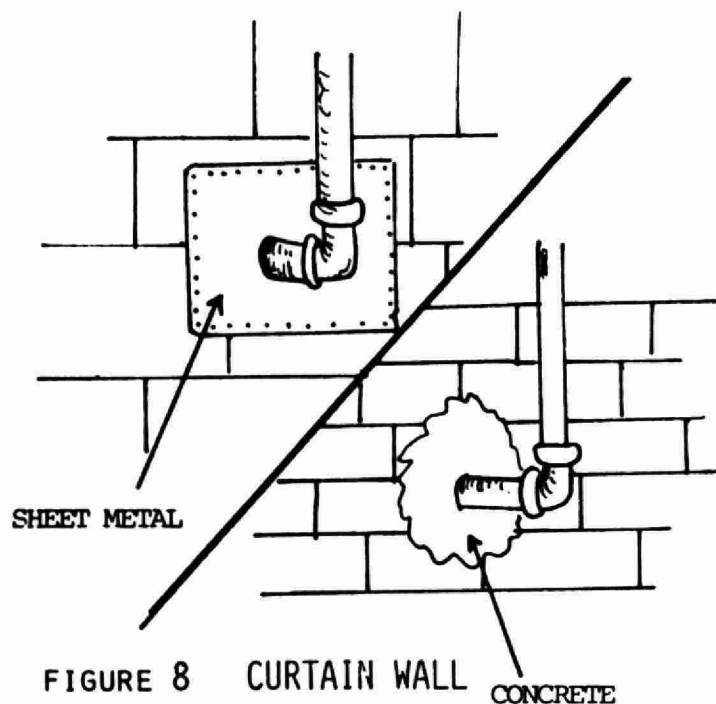
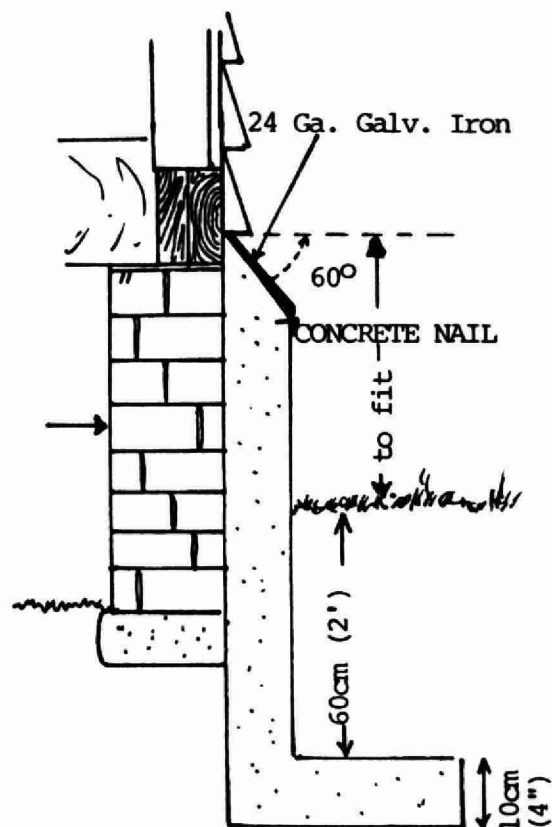


FIGURE 7 PROPER RAT-PROOFING OF PIPE OPENINGS

Openings must be found and sealed off with cement or sheet metal. Small holes difficult to seal can be tightly packed with coarse steel wool.



Where foundations cannot be completely stopped or a dirt floor exists, a curtain wall can be built. Its effectiveness is based on the psychology of the rat who burrows down to the bottom of the "L" and then goes along it rather than digging out the leg of the "L" away from his objective to get into the building. While the "L" type is recommended, some authorities feel that a straight 1 m (36") wall is just as effective in keeping the animals out and probably cheaper to build, as it requires less removal of dirt.



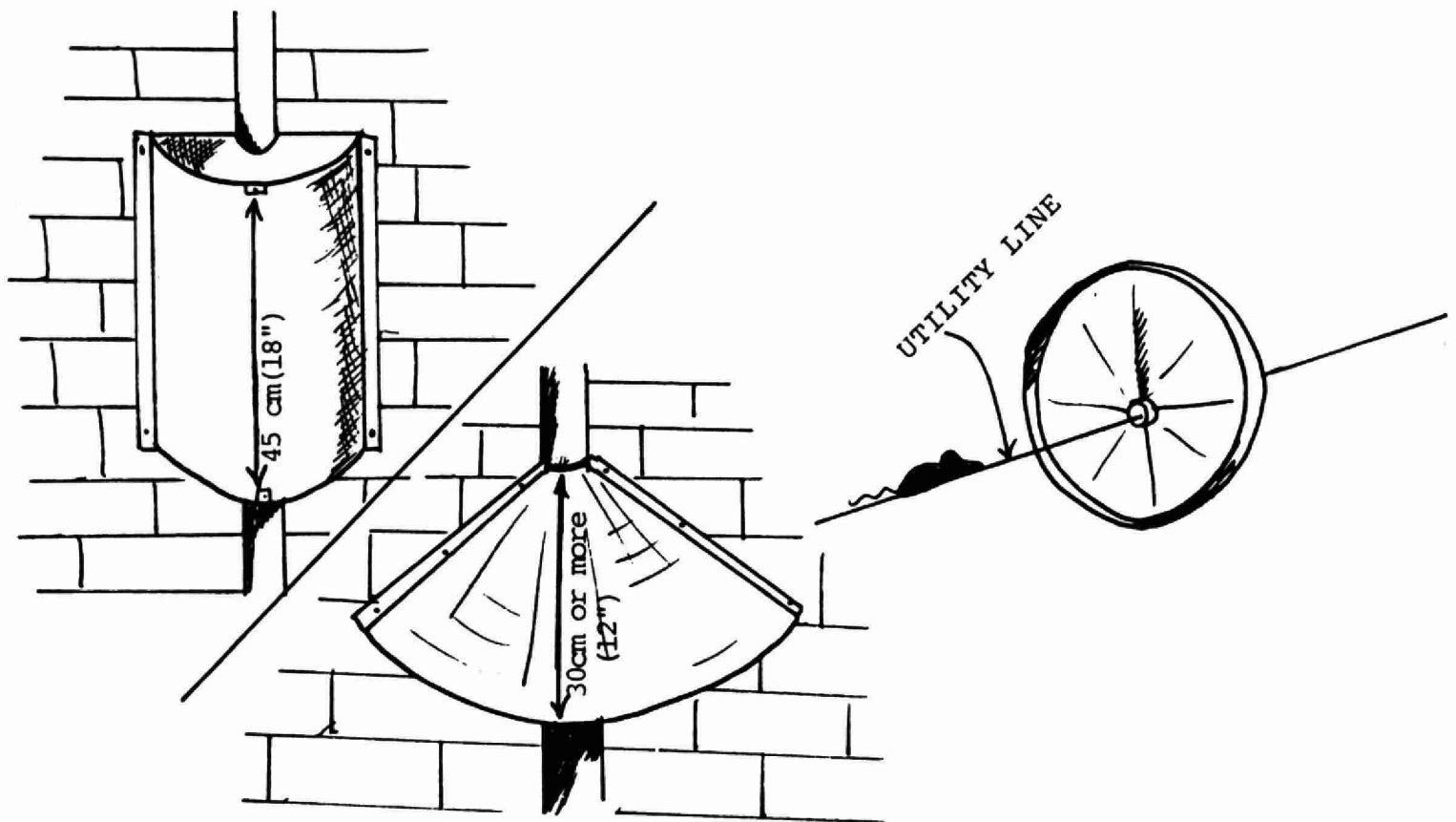


FIGURE 9 TYPES OF RAT GUARDS FOR UTILITY LINES

These are particularly vulnerable where roof rats are present. Guards with a 45 cm (18") radius are needed to interrupt the free passage of these expert wire walkers. They should be placed far enough from the building so the rats cannot jump from the wire to a point on the building. Guards should be constructed of at least 24 gauge metal. Where nails are used, these should be spaced far enough apart so as not to act as a ladder for the rats.

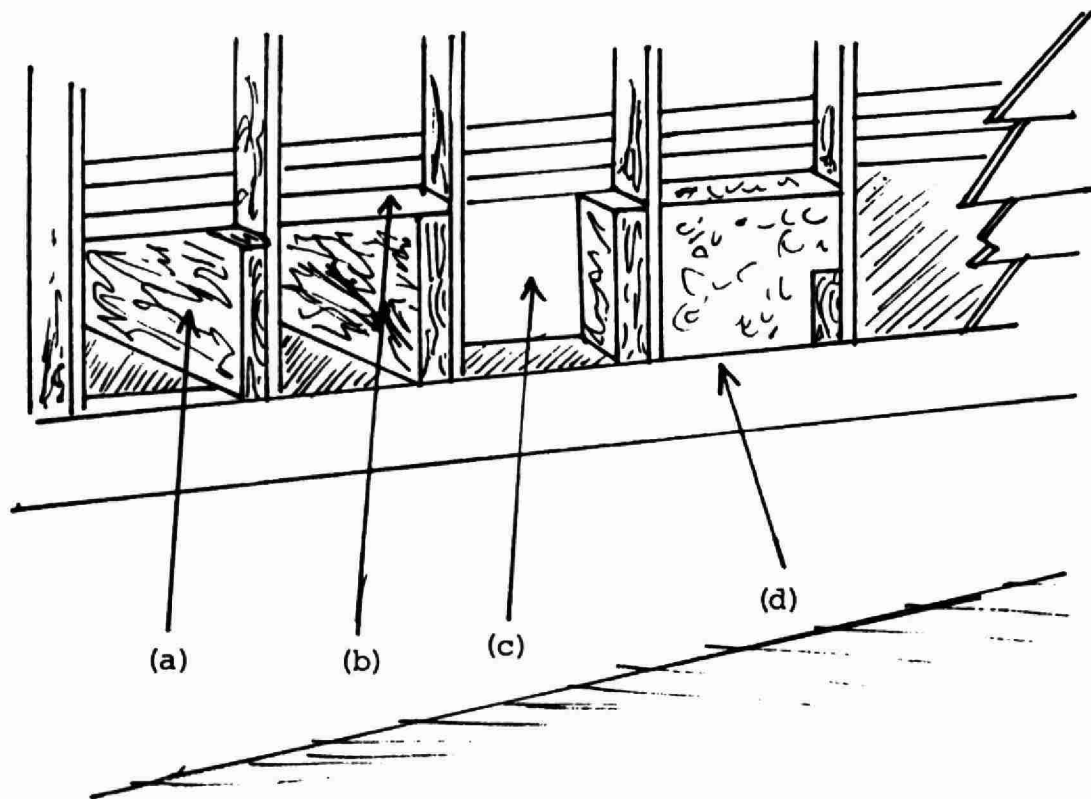


FIGURE 10 EXCLUDING RATS FROM DOUBLE WALLS

Double walls are attractive rat passageways. Eliminate them wherever possible or put in stops. Cement floors are recommended particularly in food handling establishments. Otherwise rat-resistant flooring should be used to seal off openings in the floors. Stairwells should be blocked off completely or left wide open. In multi-use buildings, it is necessary to seal the interior passageways around any food handling section.

- (a) Common type with open space between floor joists.
- (b) Wooden stops can be used in upper stores but non-combustible material is preferred at ground level.
- (c) In old buildings, galvanized sheet metal may be cut and nailed into place between studs, joists, floor, and sill.
- (d) In buildings under construction a good grade of rich cement is recommended rather than loose fill of cinders or broken bricks.